

CLAIMS

1. A tubular liner for insertion into a duct, said tubular liner defining first and second ends and a lumen, both of said first and second ends being open, such that fluid flow can occur through said tubular liner from said first end to said second end, characterised in that said liner comprises an auxetic material.
2. A tubular liner according to claim 1, defining a longitudinal axis between said first and second ends, having a structure comprising a plurality of adjacent radial loops arranged about said tubular liner, each radial loop comprising a plurality of interconnected hexagons having:
 - (i) first and second sides parallel with and opposite to one another;
 - (ii) third and fourth sides dependent from said first side; and
 - (iii) fifth and sixth sides dependent from said second side;said third side being connected to said fifth side at a first vertex, and said fourth side being connected to said sixth side at a second vertex;
said first side of each hexagon making an internal angle of less than 90 degrees with each of said third and fourth sides, and said second side making an internal angle of less than 90 degrees with each of said fifth and sixth sides;
said first and second sides of said hexagons being oriented in said longitudinal axis;
each hexagon being connected to first and second adjacent hexagons, said first side of each hexagon comprising a second side of said first adjacent hexagon, and said second side comprising a first side of said second adjacent hexagon;
each radial loop being connected to at least a first adjacent radial loop, each pair of first and second adjacent radial loops being connected by a plurality of connecting members.

3. A tubular liner according to claim 2, said plurality of connecting members being between said third and fifth sides of said plurality of hexagons of said first loop and said fourth and sixth sides of said plurality of hexagons of said second loop.

4. A tubular liner according to claim 3, said connecting members being between said first vertex of said hexagons of said first loop and said second vertex of said hexagons of said second loop.

5. A tubular liner according to claim 1, defining a longitudinal axis between said first and second ends, having a structure comprising a plurality of longitudinally elongate strips of interconnected hexagons oriented along said longitudinal axis of said tubular liner, each longitudinally elongate strip comprising a plurality of interconnected hexagons having:

- (i) first and second sides parallel with and opposite to one another;
- (ii) third and fourth sides dependent from said first side; and
- (iii) fifth and sixth sides dependent from said second side;

said third side being connected to said fifth side at a first vertex, and said fourth side being connected to said sixth side at a second vertex;

said first side of each hexagon making an internal angle of less than 90 degrees with each of said third and fourth sides, and said second side making an internal angle of less than 90 degrees with each of said fifth and sixth sides;

said first and second sides of said hexagons being oriented perpendicular to said longitudinal axis;

each hexagon being connected to at least a first adjacent hexagon, said first side of each hexagon comprising a second side of said first adjacent hexagon, and said second side comprising a first side of any second adjacent hexagon;

each longitudinally elongate strip being connected to first and second radially adjacent longitudinally elongate strips by a plurality of connecting members.

6. A tubular liner according to claim 5, said plurality of connecting members being between:

- (a) said third and fifth sides of said plurality of hexagons of said longitudinally elongate strip and said fourth and sixth sides of said plurality of hexagons of said first radially adjacent longitudinally elongate strip; and
- (b) said fourth and sixth sides of said plurality of hexagons of said longitudinally elongate strip and said third and fifth sides of said plurality of hexagons of said second radially adjacent longitudinally elongate strip.

7. A tubular liner according to claim 6, said connecting members being between:

- (a) said first vertex of said hexagons of a given longitudinally elongate strip and said second vertex of said hexagons of a first radially adjacent longitudinally elongate strip of hexagons; and
- (b) said second vertex of said hexagons of said given longitudinally elongate strip and said first vertex of said hexagons of a second radially adjacent longitudinally elongate strip of hexagons.

8. A tubular liner according to any of claims 2-7, said connecting member having a shape selected from the group consisting of: straight, curved and angled.

9. An assembly for use in lining a section of duct, said assembly comprising:

- (i) a tubular liner according to any of the preceding claims;
- (ii) a mandrel upon which said auxetic tubular liner is located; and
- (iii) a sleeve surrounding said mandrel and auxetic tubular liner, said sleeve

having an open end;

said mandrel being movable relative to said sleeve.

10. The use of a tubular liner according to any of claims 1-8 in the manufacture of an assembly according to claim 9 for use in lining a section of duct.

11. A method of manufacture of a tubular liner according to any of claims 2-8 from a tube defining first and second open ends and a lumen, said tubular liner being located on a mandrel, said method comprising the steps of:

(i) placing over a region of said tube an etching mask defining at least a part of said structure of said tubular liner; and

(ii) etching said tube through said mask to define said mask structure on said tube;

and optionally performing at least once the step of:

(iii) moving said mask relative to said tube and repeating steps (i) and (ii) to define an additional region of said mask structure on said tube.

12. A method of inserting a tubular liner according to any of claims 1-8 into a duct, said tubular liner defining first and second faces, said first face facing said lumen, said second face facing away from said lumen, said method comprising the steps of:

(i) locating said tubular liner on a mandrel surrounded by a sleeve to define an assembly, said sleeve having an open end;

(ii) passing said assembly into said duct;

(iii) moving said mandrel relative to said sleeve so as to cause said tubular liner to be displaced through said sleeve open end such that said tubular liner folds back over said sleeve and inverts within the confines of said duct such that said second face faces said lumen of said inverted tubular liner and said first face faces away from said lumen of said inverted tubular liner;

(iv) withdrawing said sleeve and said mandrel from said duct, leaving said inverted tubular liner *in situ*.